SOLAR/2036-79/06

Monthly Performance Report

PAGE JACKSON SCHOOL

JUNE 1979

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

MONTHLY PERFORMANCE REPORT

PAGE JACKSON SCHOOL

JUNE 1979

I. SYSTEM DESCRIPTION

Page Jackson School is an elementary school located in Charles Town, West Virginia. The solar energy system is designed to provide approximately 85 percent of the space heating and 50 percent of the space cooling energy requirements of the school. It has an array of flat-plate collectors with a gross area of 11,000 square feet that faces south at an angle of 45 degrees from the horizontal. Water is used as the medium for delivering solar energy from the collector array to storage. The solar heated water is stored in two interconnected 10,000-gallon storage tanks and is used for space heating and cooling. When the solar energy is insufficient to meet the heating demands, an oil-fired boiler is used to provide auxiliary hot water for heating. In the space cooling mode, the hot water from storage is supplied to an absorption chiller to generate chilled water. A conventional centrifugal chiller is used as backup whenever solar energy is insufficient to meet the space cooling demand.

The system, shown schematically in Figure 1, has three modes of solar operation.

Mode 1 - Collector-to-Storage: The collector subsystem operates independently of the other subsystems. It is active whenever the solar collector temperature is higher than the temperature in storage (hot water thermal storage). When the hot water thermal storage temperature is equal to, or greater than the collector temperature, solar pump P7 is shut down (pump P8 is a backup pump). An emergency mode of operation to prevent overheating of the collectors is manually activated to allow water to continuously circulate through the collectors.

Mode 2 - Space Heating: This mode is entered when the manual SUMMER-WINTER-AUTOMATIC switch is set to AUTOMATIC and the outside ambient temperature is below 60°F, or when the switch is set to WINTER. Whenever the temperature of the air returning from the air-handling units is below 68°F and the hot water storage temperature is less than 123°F, auxiliary heating is put into the ready condition. The burner for the boiler maintains a boiler water temperature of 160°F. When the hot water drops below 113°F, the boiler is activated, when the storage temperature rises above 113°F, or the return air temperature rises above 68°F, auxiliary heating is shut off.

Mode 3 - Space Cooling: This mode is entered when the manual SUMMER-WINTER-AUTOMATIC switch is set to AUTOMATIC and the outside ambient temperature is above 68°F, or when the switch is set to SUMMER. There are two modes of space cooling; one utilizes the absorption chiller, the other the backup centrifugal chiller. When the hot water thermal storage temperature rises above 180°F, system pumps P4, P5, and P6 are activated to generate flow through the absorption chiller. As the inlet water temperature to the chiller rises above 180°F, the chilled water temperature out of the absorption chiller will become colder. As the temperature from hot water thermal storage drops below 180°F, the reverse will occur. When the hot water thermal storage temperature drops below 171°F, system pumps will stop, and the absorption chiller will no longer be used for space cooling. If there is a demand for space cooling and the storage temperature is below 171°F, the backup centrifugal chiller is used to satisfy the demand.

II. PERFORMANCE EVALUATION

The system performance evaluations discussed in this section are based primarily on the analysis of the data presented in the attached computer-generated monthly report. This attached report consists of daily site thermal and energy values for each subsystem, plus environmental data. The performance factors discussed in this report are based upon the definitions contained in NBSIR 76-1137, Thermal Data Requirements and Performance Evaluation Procedures for the National Solar Heating and Cooling Demonstration Program.

A. Introduction

The solar energy system at Page Jackson School operated continuously during June, and satisfied 56 percent of the total space cooling energy requirements. There was no space heating demand during this month. The space cooling load of 52.23 million Btu was the largest experienced to date.

B. Weather

June is well into the cooling season in the Page Jackson School area, with a long-term average outside ambient temperature of 73°F. The actual outside ambient temperature averaged 69°F during June. The measured insolation in the plane of the collector array averaged 1,625 Btu/ft^2-day, which is slightly below the expected long-term average of 1,654 Btu/ft^2-day derived from measurements taken at the Washington, D. C. Airport.

C. System Thermal Performance

Collector - Of the 536.40 million Btu of solar energy incident on the collector array during June, 426.83 million Btu were incident on the array when there was flow through the collector array. The system collected 81.50 million Btu, or 15 percent of the total insolation incident on the collector array. The operation of solar pumps P7 and P8 required 2.51 million Btu of electrical energy.

Storage - Measurements indicated that 82.30 million Btu of energy was delivered to storage. There was no auxiliary energy input to the storage tanks this month, since the boiler is not used to support the space cooling load. The result is that a slight energy imbalance exists (0.80 million Btu) between the amount of thermal energy collected, and the amount delivered to storage, due to separate instrumentation for each measurement. This discrepancy, over the course of a month, is small enough to have little effect on the results.

The large amount of insolation during June combined with relatively small loads resulted in very high storage tank temperatures. The average temperature for the month was 187°F with five days averaging 195°F or above. This has produced relatively large thermal losses from the storage tanks this month, 23.47 million Btu.

Space Heating Load - There was no space heating load experienced during the month of June.

Space Cooling Load - A space cooling load of 49.51 million Btu was experienced during June. A total of 55.96 million Btu of solar energy was supplied to the absorption chiller, allowing it to support 56 percent of the space cooling load with solar energy. The remainder of the space cooling load was supported by the electric centrifugal chiller in the conventional (non-solar) system. Space cooling was required during 19 days, and the solar energy system was able to support 100 percent of the load on 12 of those days.

D. Observations

The total system load at Page Jackson School was significantly smaller than any experienced at the site since monthly reporting started in October 1978. This is primarily due to mild temperatures during the entire month. The amount of solar energy incident and, therefore, collected during June was large when compared to previous months. This resulted in the solar energy system supporting a relatively large portion of the loads, in spite of the poor collector performance that has been experienced at the school.

Since there was no space heating load, and the auxiliary space cooling system uses electrical rather than thermal energy input, there was no auxiliary thermal energy used in June. All of the thermal energy entering and leaving the storage tanks was solar energy this month.

Thermal energy losses from the storage tanks were quite large this month because, for most of the month, the tanks remained at extremely high temperatures. Additional insulation could probably reduce this loss, but this situation is unique, and probably will not occur often during the year.

E. Energy Savings

The Page Jackson School solar energy system resulted in no actual fossil savings due to conservation of fossil fuel at the site during June, since the auxiliary space cooling system only uses electrical energy. Total system electrical savings was 6.57 million Btu, and converting this to equivalent fossil energy yields 21.90 million Btu. Therefore, the net equivalent fossil savings was 27.77 million Btu. The fossil energy savings calculations are based on a comparison of the projected energy requirements of a conventional, fossil energy boiler, with an efficiency of 60 percent, and the energy requirements of the solar energy system.

III. ACTION STATUS

None.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: PAGE JACKSON SCHOOL   CHARLESTOWN, WEST VIRGINIA   SOLAR/2036-79/06
REPORT PERIOD: JUNE,1979

SITE/SYSTEM DESCRIPTION:
THE PAGE JACKSON SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING AND COOLING. THE SYSTEM USES WATER AS A COLLECTION AND STORAGE MEDIUM. HOT WATER FROM THE STORAGE TANK IS DIRECTED EITHER TO IN-DUCT HEATING COILS OR TO THE GENERATOR OF AN ABSORPTION AIR CONDITIONER. A FUEL OIL FIRED BOILER PROVIDES AUXILIARY HOT WATER FOR SPACE HEATING. A CENTRIFUGAL CHILLER PROVIDES ADDITIONAL CHILLED WATER FOR SPACE COOLING.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	536.404	MILLION BTU
	48764	BTU/SQ.FT.
COLLECTED SOLAR ENERGY	81.497	MILLION BTU
	7409	BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	69	DEGREES F
AVERAGE BUILDING TEMPERATURE	76	DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.11	
ECSS OPERATING ENERGY	2.508	MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	23.708	MILLION BTU
TOTAL ENERGY CONSUMED	112.393	MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL	
LOAD	N.A.	0.000	49.506	49.506	MILLION BTU
SOLAR FRACTION	N.A.	0	56	56	PERCENT
SOLAR ENERGY USED	N.A.	0.000	55.959	56.394	MILLION BTU
OPERATING ENERGY	N.A.	0.000	21.200	23.708	MILLION BTU
AUX. THERMAL ENERGY	N.A.	0.000	4.603	4.603	MILLION BTU
AUX. ELECTRIC FUEL	N.A.	N.A.	6.576	6.576	MILLION BTU
AUX. FOSSIL FUEL	N.A.	0.000	N.A.	0.000	MILLION BTU
ELECTRICAL SAVINGS	N.A.	0.000	8.961	6.575	MILLION BTU
FOSSIL SAVINGS	N.A.	0.000	N.A.	0.000	MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.491

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: PAGE JACKSON SCHOOL   CHARLESTOWN, WEST VIRGINIA   SOLAR/2036-79/06
REPORT PERIOD: JUNE,1979

SITE/SYSTEM DESCRIPTION:
THE PAGE JACKSON SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING AND COOLING. THE SYSTEM USES WATER AS A COLLECTION AND STORAGE MEDIUM. HOT WATER FROM THE STORAGE TANK IS DIRECTED EITHER TO IN-DUCT HEATING COILS OR TO THE GENERATOR OF AN ABSORPTION AIR CONDITIONER. A FUEL OIL FIRED BOILER PROVIDES AUXILIARY HOT WATER FOR SPACE HEATING. A CENTRIFUGAL CHILLER PROVIDES ADDITIONAL CHILLED WATER FOR SPACE COOLING.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	565.906 GIGA JOULES
	553766 KJ/SQ.M.
COLLECTED SOLAR ENERGY	85.980 GIGA JOULES
	84135 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	20 DEGREES C
AVERAGE BUILDING TEMPERATURE	25 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.11
ECSS OPERATING ENERGY	2.646 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	25.012 GIGA JOULES
TOTAL ENERGY CONSUMED	118.575 GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	N.A.	0.000	52.229	52.229 GIGA JOULES
SOLAR FRACTION	N.A.	0	56	56 PERCENT
SOLAR ENERGY USED	N.A.	0.000	59.037	59.495 GIGA JOULES
OPERATING ENERGY	N.A.	0.000	22.366	25.012 GIGA JOULES
AUX. THERMAL ENG	N.A.	0.000	4.856	4.856 GIGA JOULES
AUX. ELECTRIC FUEL	N.A.	N.A.	6.937	6.937 GIGA JOULES
AUX. FOSSIL FUEL	N.A.	0.000	N.A.	0.000 GIGA JOULES
ELECTRICAL SAVINGS	N.A.	0.000	9.453	6.937 GIGA JOULES
FOSSIL SAVINGS	N.A.	0.000	N.A.	0.000 GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.491

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM, FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: PAGE JACKSON SCHOOL   CHARLESTOWN, WEST VIRGINIA   SOLAR/2036-79/06
REPORT PERIOD: JUNE,1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	12.820	71	0.981	N	0.037	N	0.077
2	18.748	74	0.000	O	0.120	O	0.000
3	2.212	63	0.000	T	0.000	T	0.000
4	21.388	67	2.553		0.094		0.119
5	20.775	71	2.675	A	0.114	A	0.129
6	16.622	73	4.222	P	0.092	P	0.254
7	19.701	75	0.000	P	0.107	P	0.000
8	17.115	77	2.215	L	0.081	L	0.129
9	20.778	78	0.000	I	0.117	I	0.000
10	13.332	77	0.000	C	0.073	C	0.000
11	11.642	64	3.058	A	0.030	A	0.263
12	26.185	62	1.414	B	0.105	B	0.054
13	24.230	62	3.962	L	0.100	L	0.164
14	26.479	66	6.512	E	0.118	E	0.246
15	24.301	71	5.022		0.116		0.207
16	18.698	70	0.000		0.112		0.000
17	2.983	64	0.000		0.000		0.000
18	22.798	70	0.682		0.110		0.030
19	21.912	67	4.049		0.111		0.185
20	24.420	70	3.477		0.121		0.142
21	7.976	64	2.860		0.025		0.359
22	19.370	73	0.000		0.096		0.000
23	16.805	74	0.000		0.098		0.000
24	7.353	57	0.000		0.000		0.000
25	26.563	60	2.931		0.111		0.110
26	23.165	63	3.831		0.099		0.165
27	24.256	67	4.035		0.110		0.166
28	17.765	71	0.000		0.089		0.000
29	18.269	73	1.915		0.105		0.105
30	7.746	69	0.000		0.017		0.000
SUM	536.404	-	56.394	N.A.	2.508	N.A.	-
AVG	17.880	69	1.880	N.A.	0.084	N.A.	0.105
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VISOLAR/2036-79/06
REPORT PERIOD: JUNE,1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	12.820	6.349	1.059	75	0.083
2	18.748	16.577	2.731	84	0.146
3	2.212	0.000	0.000	64	0.000
4	21.388	18.436	3.671	73	0.172
5	20.775	18.027	3.182	83	0.153
6	16.622	12.772	2.667	84	0.160
7	19.701	16.942	2.987	85	0.152
8	17.115	13.684	2.494	84	0.146
9	20.778	18.874	3.601	*	0.173
10	13.332	9.125	0.708	86	0.053
11	11.642	3.930	0.164	64	0.014
12	26.185	22.417	4.861	70	0.186
13	24.230	20.557	4.710	69	0.194
14	26.479	23.391	5.967	79	0.225
15	24.301	21.514	5.661	85	0.233
16	18.698	16.132	2.198	83	0.118
17	2.983	0.000	0.000	65	0.000
18	22.798	19.861	3.219	80	0.141
19	21.912	18.456	2.868	75	0.131
20	24.420	21.713	4.804	78	0.197
21	7.976	2.240	0.003	67	0.000
22	19.370	17.886	4.281	*	0.221
23	16.805	13.329	1.678	84	0.100
24	7.353	0.000	0.000	57	0.000
25	26.563	23.434	5.152	69	0.194
26	23.165	19.349	4.171	*	0.180
27	24.256	21.077	4.528	77	0.187
28	17.765	13.955	2.077	82	0.117
29	18.269	14.858	2.040	84	0.112
30	7.746	1.946	0.016	74	0.002
SUM	536.404	426.829	81.497	-	-
AVG	17.880	14.228	2.717	76	0.152
NBSID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VISOLAR/2036-79/06
REPORT PERIOD: JUNE,1979

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	1.096	0.981	-0.350	173	0.577
2	2.720	0.000	2.355	179	0.866
3	0.000	0.000	-0.518	185	1.000
4	3.759	2.553	0.193	184	0.731
5	3.197	2.675	-0.309	184	0.740
6	2.691	4.222	-2.429	173	0.666
7	3.043	0.000	2.568	176	0.844
8	2.516	2.215	-0.333	179	0.748
9	3.631	0.000	2.861	189	0.788
10	0.707	0.000	-0.215	198	-0.304
11	0.192	3.058	-3.601	183	-2.836
12	4.984	1.414	3.178	185	0.921
13	4.806	3.962	-0.277	194	0.767
14	6.071	6.512	-1.444	185	0.835
15	5.712	5.022	-0.379	179	0.813
16	2.278	0.000	1.676	186	0.736
17	0.000	0.000	-0.493	190	1.000
18	3.279	0.682	1.778	193	0.751
19	2.910	4.049	-2.211	192	0.632
20	4.889	3.477	0.556	186	0.825
21	0.013	2.860	-3.885	175	-77.056
22	4.301	0.000	3.908	178	0.909
23	1.588	0.000	0.871	192	0.548
24	0.000	0.000	-0.562	193	1.000
25	5.118	2.931	1.192	195	0.806
26	4.228	3.831	-0.584	197	0.768
27	4.460	4.035	-0.578	192	0.775
28	2.055	0.000	1.346	196	0.655
29	2.044	1.915	-0.915	196	0.489
30	0.019	0.000	-0.964	191	-50.270
SUM	82.303	56.394	2.437	-	-
AVG	2.743	1.880	0.081	187	0.715
NBS ID	Q200	Q201	Q202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: PAGE JACKSON SCHOOL   CHARLESTOWN, WEST VIRGINIA   SOLAR/2036-79/06
REPORT PERIOD: JUNE,1979

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	N	N	N	N	N	N	N	N	N	N	N	N
2	O	O	O	O	O	O	O	O	O	O	O	O
3	T	T	T	T	T	T	T	T	T	T	T	T
4												
5	A	A	A	A	A	A	A	A	A	A	A	A
6	P	P	P	P	P	P	P	P	P	P	P	P
7	P	P	P	P	P	P	P	P	P	P	P	P
8	L	L	L	L	L	L	L	L	L	L	L	L
9	I	I	I	I	I	I	I	I	I	I	I	I
10	C	C	C	C	C	C	C	C	C	C	C	C
11	A	A	A	A	A	A	A	A	A	A	A	A
12	B	B	B	B	B	B	B	B	B	B	B	B
13	L	L	L	L	L	L	L	L	L	L	L	L
14	E	E	E	E	E	E	E	E	E	E	E	E
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
SUM	N.A.	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	-	-	N.A.
AVG	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: PAGE JACKSON SCHOOL   CHARLESTOWN, WEST VI   SOLAR/2036-79/06
REPORT PERIOD: JUNE,1979

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.000	0	0.000	0.000	0.000	N	0.000	0.000	0.000	75	71
2	0.000	0	0.000	0.000	0.000	O	0.000	0.000	0.000	78	74
3	0.000	0	0.000	0.000	0.000	T	0.000	0.000	0.000	77	63
4	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	77	67
5	0.000	0	0.000	0.000	0.000	A	0.000	0.000	0.000	77	71
6	0.000	0	0.000	0.000	0.000	P	0.000	0.000	0.000	78	73
7	0.000	0	0.000	0.000	0.000	P	0.000	0.000	0.000	77	75
8	0.000	0	0.000	0.000	0.000	L	0.000	0.000	0.000	77	77
9	0.000	0	0.000	0.000	0.000	I	0.000	0.000	0.000	79	78
10	0.000	0	0.000	0.000	0.000	C	0.000	0.000	0.000	80	77
11	0.000	0	0.000	0.000	0.000	A	0.000	0.000	0.000	77	64
12	0.000	0	0.000	0.000	0.000	B	0.000	0.000	0.000	74	62
13	0.000	0	0.000	0.000	0.000	L	0.000	0.000	0.000	75	62
14	0.000	0	0.000	0.000	0.000	E	0.000	0.000	0.000	75	66
15	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	76	71
16	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	78	70
17	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	76	64
18	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	75	70
19	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	75	67
20	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	76	70
21	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	74	64
22	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	77	73
23	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	78	74
24	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	75	57
25	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	73	60
26	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	74	63
27	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	74	67
28	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	77	71
29	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	78	73
30	0.000	0	0.000	0.000	0.000		0.000	0.000	0.000	78	69
SUM	0.000	-	0.000	0.000	0.000	N.A.	0.000	0.000	0.000	-	. -
AVG	0.000	0	0.000	0.000	0.000	N.A.	0.000	0.000	0.000	76	69
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE COOLING SUBSYSTEM

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VIRGINIA SOLAR/2036-79/06
REPORT PERIOD: JUNE,1979

DAY OF MON.	SPACE COOLING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG DRY BULB TEMP F	AMB TEMP DEG F
1	3.134	15	0.981	1.076	0.573	0.819	N	0.146	N	75	71
2	0.000	0	0.000	0.000	0.000	0.000	O	0.000	O	78	74
3	0.000	0	0.000	0.000	0.000	0.000	T	0.000	T	77	63
4	2.069	62	2.553	0.760	0.188	0.268		0.466		77	67
5	4.297	35	2.675	1.283	0.605	0.864	A	0.536	A	77	71
6	2.438	100	4.222	1.494	0.000	0.000	P	0.797	P	78	73
7	5.829	0	0.000	1.662	1.220	1.743	P	0.000	P	77	75
8	5.045	22	2.215	1.762	0.809	1.156	L	0.405	L	77	77
9	0.000	0	0.000	0.000	0.000	0.000	I	0.000	I	79	78
10	0.000	0	0.000	0.000	0.000	0.000	C	0.000	C	80	77
11	1.421	100	3.058	1.157	0.000	0.000	A	0.434	A	77	64
12	2.902	23	1.414	1.068	0.448	0.641	B	0.250	B	74	62
13	2.247	100	3.962	1.104	0.000	0.000	L	0.761	L	75	62
14	3.250	100	6.229	1.714	0.000	0.000	E	1.039	E	75	65
15	2.672	100	5.022	1.419	0.000	0.000		0.872		76	71
16	0.000	0	0.000	0.000	0.000	0.000		0.000		78	70
17	0.000	0	0.000	0.000	0.000	0.000		0.000		76	64
18	3.894	6	0.682	1.096	0.759	1.084		0.087		75	70
19	1.846	100	4.049	1.087	0.000	0.000		0.572		75	67
20	1.434	100	3.326	0.741	0.000	0.000		0.421		76	70
21	1.394	100	2.860	0.793	0.000	0.000		0.425		74	64
22	0.000	0	0.000	0.000	0.000	0.000		0.000		77	73
23	0.000	0	0.000	0.000	0.000	0.000		0.000		78	74
24	0.000	0	0.000	0.000	0.000	0.000		0.000		76	57
25	1.208	100	2.931	0.613	0.000	0.000		0.379		73	60
26	1.858	100	3.831	0.924	0.000	0.000		0.590		74	63
27	1.844	100	4.035	0.989	0.000	0.000		0.577		74	67
28	0.000	0	0.000	0.000	0.000	0.000		0.000		77	71
29	0.725	100	1.915	0.459	0.000	0.000		0.205		78	73
30	0.000	0	0.000	0.000	0.000	0.000		0.000		78	69
SUM	49.506	-	55.959	21.200	4.603	6.576	N.A.	8.961	N.A.	-	-
AVG	1.650	56	1.865	0.707	0.153	0.219	N.A.	0.299	N.A.	76	69
NBS	Q502	N500	Q500	Q503	Q501		Q508	Q512	Q514	N405	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VIRGINIA SOLAR/2036-79/06
REPORT PERIOD: JUNE,1979

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	1165	N	71	75	N	N	N
2	1704	O	74	84	O	O	O
3	201	T	63	64	T	T	T
4	1944		67	73			
5	1389	A	71	83	A	A	A
6	1511	P	73	84	P	P	P
7	1791	P	75	85	P	P	P
8	1556	L	77	84	L	L	L
9	1889	I	78	*	I	I	I
10	1212	C	77	86	C	C	C
11	1058	A	64	64	A	A	A
12	2380	B	62	70	B	B	B
13	2203	L	62	69	L	L	L
14	2407	E	66	79	E	E	E
15	2209		71	85			
16	1700		70	83			
17	271		64	65			
18	2073		70	80			
19	1992		67	75			
20	2220		70	78			
21	725		64	67			
22	1761		73	*			
23	1528		74	84			
24	568		57	57			
25	2415		60	69			
26	2106		63	*			
27	2205		67	77			
28	1615		71	82			
29	1561		73	84			
30	704		69	74			
SUM	48764	N.A.	-	-	-	-	-
AVG	1525	N.A.	69	76	N.A.	N.A.	N.A.
NBS ID	Q001		N113			N115	N114

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
THERMODYNAMIC CONVERSION EQUIPMENT

SITE: PAGE JACKSON SCHOOL CHARLESTOWN, WEST VI SOLAR/2036-79/06
REPORT PERIOD: JUNE,1979

DAY OF MONTH	EQUIPMENT LOAD MILLION BTU	THERMAL ENERGY INPUT MILLION BTU	OPERATING ENERGY MILLION BTU	ENERGY REJECTED MILLION BTU	COEFFICIENT OF PERFORMANCE (SEE NOTE)
1	0.471	0.981	0.140	N	0.480
2	0.000	0.000	0.000	O	0.000
3	0.000	0.000	0.000	T	0.000
4	1.290	2.553	0.330		0.505
5	1.502	2.675	0.292	A	0.561
6	2.438	4.222	0.625	P	0.577
7	0.000	0.000	0.000	P	0.000
8	1.123	2.215	0.306	L	0.507
9	0.000	0.000	0.000	I	0.000
10	0.000	0.000	0.000	C	0.000
11	1.421	3.058	0.398	A	0.465
12	0.671	1.414	0.153	B	0.474
13	2.247	3.962	0.410	L	0.567
14	3.250	6.229	0.740	E	0.522
15	2.672	5.022	0.673		0.532
16	0.000	0.000	0.000		0.000
17	0.000	0.000	0.000		0.000
18	0.244	0.682	0.082		0.357
19	1.846	4.049	0.491		0.456
20	1.434	3.326	0.465		0.431
21	1.394	2.860	0.434		0.487
22	0.000	0.000	0.000		0.000
23	0.000	0.000	0.000		0.000
24	0.000	0.000	0.000		0.000
25	1.208	2.931	0.353		0.417
26	1.858	3.831	0.435		0.485
27	1.844	4.035	0.541		0.457
28	0.000	0.000	0.000		0.000
29	0.725	1.915	0.272		0.379
30	0.000	0.000	0.000		0.000
SUM	27.637	55.959	7.141	*	0.494
AVG	0.921	1.865	0.238	*	0.016

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.
NOTE:

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
AUXILIARY THERMODYNAMIC CONVERSION EQUIPMENT

SITE: PAGE JACKSON SCHOOL   CHARLESTOWN, WEST VISOLAR/2036-79/06
REPORT PERIOD: JUNE,1979

DAY OF MONTH	EQUIPMENT LOAD MILLION BTU	THERMAL ENERGY INPUT MILLION BTU	OPERATING ENERGY MILLION BTU	ENERGY REJECTED MILLION BTU	COEFFICIENT OF PERFORMANCE (SEE NOTE)
1	2.663	0.819	0.975	N	3.250
2	0.000	0.000	0.000	O	0.000
3	0.000	0.000	0.000	T	0.000
4	0.779	0.268	0.334		2.906
5	2.795	0.864	1.064	A	3.236
6	0.000	0.000	0.000	P	0.000
7	5.829	1.743	2.129	P	3.344
8	3.922	1.156	1.379	L	3.392
9	0.000	0.000	0.000	I	0.000
10	0.000	0.000	0.000	C	0.000
11	0.000	0.000	0.000	A	0.000
12	2.231	0.641	0.808	B	3.483
13	0.000	0.000	0.000	L	0.000
14	0.000	0.000	0.000	E	0.000
15	0.000	0.000	0.000		0.000
16	0.000	0.000	0.000		0.000
17	0.000	0.000	0.000		0.000
18	3.650	1.084	1.304		3.366
19	0.000	0.000	0.000		0.000
20	0.000	0.000	0.000		0.000
21	0.000	0.000	0.000		0.000
22	0.000	0.000	0.000		0.000
23	0.000	0.000	0.000		0.000
24	0.000	0.000	0.000		0.000
25	0.000	0.000	0.000		0.000
26	0.000	0.000	0.000		0.000
27	0.000	0.000	0.000		0.000
28	0.000	0.000	0.000		0.000
29	0.000	0.000	0.000		0.000
30	0.000	0.000	0.000		0.000
SUM	21.869	6.576	7.993	*	-
AVG	0.729	0.219	0.266	N.A.	3.326

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.
NOTE: